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ANNOTATED BIBLIOGRAPHY ON THE PLANNING ASPECTS OF AIR POLLUTION CONTROL

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Northeastern Illinois Planning Commission

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Literature in the areas of city planning, architecture, landscape architecture, environmental health, climatology, and real estate was researched. Literature on areas such as micrometeorology and the legal aspects of air pollution was examined only in so far as it was necessary to more completely understand the application of certain planning principles to air pollution control.

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Annotated Bibliography on the Planning Aspects of Air Pollution Control

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by William J. Pelle, Jr. for
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and
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This research was completed as part of the work program for the "Air Resource Management Study for Northeastern Illinois", which is being administered by the Northeastern Illinois Planning Commission in cooperation with the Department of Air Pollution Control of the City of Chicago, Department of Health of the State of Illinois, and the United States Public Health Service. The study is financed in part through an urban planning grant from the Housing and Home Finance Agency, under the provisions of Section 701 of the Housing Act of 1954 as amended.

Major points from this bibliography are incorporated into two papers, one which is a preliminary draft for limited distribution (December 18, 1964) and another which is a revised draft to be completed during April, 1965. A supplement to this annotated bibliography may be completed at a later date.

In preparation of this work, planning principles were researched in relationship to air pollution control. Work involved research in the following fields: city planning, architecture, landscape architecture, environmental health, climatology, real estate. Literature on areas such a micrometeorology and the legal aspects of air pollution was examined only in so far as it was necessary to more completely understand the application of certain planning principles to air pollution control.

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"Affect of Air Pollution on Real Estate Values" American City, March, 1940

The article states that there is depreciation of real estate values resulting from the abandonment of properties in smoke-laden areas of a city. However, the article is too short and general to be useful.

"Air Flow Around Buildings" Architectural Forum September 1957, p. 166-168, 3 photographs, diagrams

This article provides excellent, concise information on the effects of building shapes on eddy currents. Measurements were directed at finding 1) the general air pattern around a building; 2) the general distribution of air pressure; and 3) the dimensions of the eddy area built up on the downwind side of the building by the difference in pressure between the side getting the brunt of the wind and its opposite. On the whole, the larger the eddy, the lower the volume of air around the building, and vice versa. Thus, in cold climates, building shapes and orientations that maximize eddy areas offer the greatest protection from wind; while in hot, humid climates, configurations that give the smallest eddy area possible allow a maximum of cooling air to flow around and through the structure.

It was found that some large variables in building shapes, such as height, have almost no effect on air pattern over a building, though height considerably increases eddy area. At the same time many minor variations, such as the direction and pitch of shed roofs, resulted in very large changes in air flow. As a generalization, it might be observed that the tall, thin slab building, whose large eddy area makes it quite efficient in the north for protection from winds, does not appear to be ideal for hot climates, where the maximum of breezes around a building is desirable.

Height of basic building block increases low pressure, turbulent downwind eddy. The larger this low pressure eddy area is, the less air swirls around the building's walls, and vice versa. Depth of building block even more sharply affects size of eddy area (where height remains constant). Largest eddy area and greatest protection from wind is afforded by the thinnest mass. As length increases (height and depth remaining constant), length and depth of eddy grows. Tall thin slab is not ideal where maximum breeze is desirable.

Air Pollution Conference at Strasbourg, June 24 - July 1, 1964, Point II, Town and Country Planning

Mr. Van Meurs (Netherlands) gave a detailed review of the numerous factors in town and country planning that have a bearing on air pollution. He made nineteen specific points (in his summary) while an appendix in the form of a

table of physical planning measures that could assist clean air contained forty-nine headings or items. These included such diverse matters as: limitation of housing and industrial building densities, green spaces and green belts, separation of motor and other traffic, closing streets for motor traffic, wider streets and roads, restricting building on traffic roads, closing factories, preservation of forests.

American Society of Landscape Architects. Policy No. 4 Atmospheric Pollution
ASLA, 2000 K St., N. W., Washington D.C. 20006/January 1964

The American Society of Landscape Architects protests against pollution of the atmosphere by noxious emissions from vehicles and from industries, and by cities and towns across the nation which contribute to the nuisance and damage resulting from needless air pollution, all of which are detrimental to health, comfort and property.

The Society strongly urges all industry to eradicate its share of harmful and unpleasant contamination of the atmosphere; and it urges all appropriate levels of government to implement tax and depreciation allowances for inc offset the cost burden for installation of effective air pollution controls.

The Society strongly urges a much more aggressive pursuit of the means necessary to eliminate completely from the atmosphere all undesirable and harmful air pollutants; and immediate adoption and enforcement of adequate legislative controls by government to control noxious emissions effectively.

The most dangerous contaminants to public health and property are four: carbon monoxide, nitrogen oxides, sulfur oxides, and ozone. The primary source of these air pollutants has been found to be petroleum fuels, of which automobiles and trucks are major contributors, due to the millions in everyday use. If mass transportation produces less pollution than personal vehicles under optimum conditions for each, it should be promoted so that it has relatively advantageous position. The Society vehemently implores the transportation industry -- automotive, aircraft, and rail -- to develop without delay more efficient power plants capable of eliminating or greatly reducing air pollutants; and it implores the petroleum industry to accelerate research and development of fuels free of harmful and unpleasant by-products of combustion.

American Society of Planning Officials, Planning Advisory Service, "Air Pollution - A Growing Urban Problem", Report No. 79, (October, 1959)

The paper gives some insight into the limitations of existing air pollution controls, which have definite planning implications. For example, projections of carbon monoxide are dependent not only on new devices, but also in the

absolute increase in the number of cars. It is also stated that in situations already severe (ie: Los Angeles County) it doesn't do any good to locate new industries downwind. Many smaller communities, which are still able to regulate location of new industry can do this, although what may be downwind from one city may be upwind from another. There is also a discussion of density controls as a means of diluting the effects of noxious or toxic effluents; however, this, too, is limiting since it is questionable as to how much effect this would have in the total amount of emissions.

American Society of Planning Officials, Planning Advisory Service, "Air Pollution Control" Information Report No. 20, November, 1950 29 pp.

There is a good discussion on the economic losses due to air pollution, on the multi-purpose effects of air pollution control, and on the legal aspects of air pollution control. Court cases are cited. There is a comparison of the punitive type with the preventive type of air pollution control. It is stated that the punitive type of air pollution control ordinance is rarely effective because the fear of a fine is not sufficient to correct poor firing methods or inadequate equipment. Other defects of the punitive type are that an adequate enforcing staff is seldom provided, and that certain industries and private residences are often exempted from the ordinance provisions.

American Society of Planning Officials, Planning Advisory Service ((nformation Report No. 160) "New Techniques for Shaping Urban Expansion" (July, 1962) 22 pp.

The article describes the trend in industrial performance standards. Charles Haar discusses the shift of zoning controls to a type of licensing procedure. He attributes this to a demand for flexibility: "There is greater use of licensing techniques relative to the self-executing statute. Thus, the number of special uses, admissible in specific districts, but only upon the discretionary grant of the application for a permit, has risen over the years. Thus, too, the newer device of flexible zoning or floating zones - the creation of districts which instead of being mapped in advance are delineated by amendment upon petition or application - has gained in popularity.

American Society of Planning Officials, Planning Advisory Service, Report No.32 "Performance Standards in Industrial Zoning" (November, 1951)

Adverse pollution effects from automotive travel include not only those resulting from unburned hydrocarbons, but also those coming from dirt agitation from the

wheels of cars and trucks. There is discussion of regulating industrial nuisances such as air pollution by subjecting industrial districts to certain shifts, not operating on Sundays, holidays, nights, etc., and by using density measure of so many carloads per day per acre, or so many employees per industry, in an effort to limit the amount of traffic. There is an examination of performance standards for smoke, odor, dust and dirt, noxious gases, glare and heat, industrial sewage wastes, and traffic and transportation.

American Society of Planning Officials (Planning Advisory Service) "Zoning Buffers: Solution or Panacea?" Report No. 133, April 1960

The green buffer concept is discussed generally as an attempt to lessen any incompatibility, or to cancel out effects that would occur if a buffer were not there. Much consideration is given to the effects of green areas on filtering noise, but the concept of employing green areas as visual buffers, which is applicable for air pollution control since the visibility of air pollution could be blocked out, is discussed extensively. The dimensions of width of green areas for such purposes is covered, and specific ordinances with distance standards and opacity standards for green area development, are included in the appendix.

Use of a green area as a visual screen is a significant psychological control measure, and for this reason, should be researched carefully.

Beryushev, K. G. APCA Abstract 2965 - (Problems in Planning and Building of Cities and Protection of the Atmosphere in England) Voprosy planirovki i zastroiki gordov i okhrany atmosfernogo vozdukha v Anglii. U. S. Joint Public Research Service, No. L - 758 - N May 6, 1959, 11 pp. Found in: Gigiena Sanitania (Moscow) 23, 72-9 July 1958) Available OTS, U. S. Department of Commerce, Washington 25, D. C. Translation No. 59-13452

A rather generalized report is made by the author as one of three members of a delegation from the Soviet Union attending an International Congress of the Royal Health Society of Great Britain which was held in the spring of 1957 in the city of Folkstone. The delegation also visited several scientific institutions and other installations. Several of the papers of the Congress, which are reviewed very briefly, dealt directly with problems of air pollution. In summarizing, it is stated that it is important to emphasize that the measures for protection of the atmosphere in Great Britain are being carried out on a very limited scale and have not acquired a national character. The scientific works of Soviet hygienists, and the practical work in preventive sanitary inspection done by Soviet sanitation service doctors in this direction, are both

more progressive and are of serious importance in combatting atmospheric pollution. In the field of planning and building cities, and also in housing construction, it is stated that Soviet city planners should take into account certain valuable procedures used in the construction of the new cities in England. A group of 9 suggestions, based on this information, is outlined.

In Crowley, however, which is located 40 to 50 kilometers from the center of London, and was established on the basis of a small village and the adjacent empty territory, there is evidence of some effort to control air pollution through planning. In the industrial district are located the industrial enterprises which do not possess great sanitary hazards: electrical instrument - building, electronics, typography, wood finishing, foodstuffs, etc. The minimal distance between the boundaries of the enterprises and the residential districts is 200 meters, and from the further removed enterprises it is 600 meters. Between the sites of the industrial enterprises and the streets are broad strips of lawn with plantings of trees.

Catterall, Mary, "Air Pollution: the Human Problem" Smokeless Air, No. 128 Winter, 1963, p. 142

The article gives a brief account on the psychological and health effects of air pollution in the northern industrial areas of England. It is postulated that in the northern industrial areas, children may begin employment earlier because bronchitis among fathers in the north may be more severe. The article states that the psychological stress of air pollution has never been accurately assessed, but that it has been shown that people work more efficiently in clean and pleasant surroundings. The author feels that air pollution has decreased the amenities that are needed to draw top executives into the area.

Chandler, T. J. "City Growth and Urban Climates" Weather, Vol. XIX, No. 6, June, 1964 pp. 170-171

It is stated, on the whole, that increasing heat island intensities in London and other cities during the present century are related to increasing regional temperatures rather than the expansion of the built-up area. Mean heat-island intensities are by no means a linear function of the area of cities, or individually of their growth. The thermal effects of quite small towns, even compact villages, are often surprisingly large. This is not to deny all thermal consequences of urban growth, for the length of traverse by winds over the city will affect its temperatures both directly and indirectly through changes in the character of the wind field. Changes in wind speed and direction as air moves across the city are difficult to analyse, but work in London has shown several interesting relationships, one of which is that at times of light winds

at London airport (below about 9 mi. hr.$^{-1}$ (4 m sec $^{-1}$)) - the precise figure varies with the time of day and the season, speeds are increased in central London but with strong winds there is a decrease.

Cionco, R. M.; Ohmstede, W. D.; Appleby, J. F. "Model for Wind Flow in an Idealized Vegetative Canopy" Meteorology Department, U. S. Army, June, 1963.

The purpose of the report is to present the results of a study which examines the characteristic parameters of wind flow in an idealized vegetative canopy. Equations characterizing the wind flow in and above the vegetative canopy are derived and compared with data collected in and above various crops.

Observations taken in a corn field indicate a marked similarity to the flow derived for the ideal canopy. Although the utility of the approach was not proven, the concept does seem to show promise.

Cofer, J. I. APCA Abstract No. 4705 "Planning and Zoning for Air Pollution Control" Proceedings of the 7th Annual Air and Water Pollution Conference, 13-16. Edited by L. J. Murphy, Eng. Ser. Bulletin No. 54, Eng. Expt. Sta. University of Missouri Bulletin, Columbia Missouri, April 15, 1962.

Two main areas are pointed out as those in which the city planner and the air pollution expert will have a joint concern. These are (1) planning of the location of industries to minimize the effects of air pollution, and (2) control of industries in particular locations by means of zoning regulations. The first zoning regulations were adopted by New York in 1916 and now apply to virtually every major city in the country. Such regulations divide an area into zones or districts and state the regulations applying to the use and development of property in each district. It is now becoming recognized that the name of the use is not nearly as important as the manner in which it is conducted as so performance standard ordinances are coming into greater use. Since 1951, such ordinances have been adopted by perhaps 100 communities, including New York, Denver, and Chicago, the latter being the most comprehensive at the time of adoption in 1957. Such regulations have been proposed for Johnson and Wyandotte Counties (Kansas) in the Kansas City Metropolitan Area but are not yet adopted. The principal objections to this type of regulation are lack of enforcement equipment and trained personnel and lack of faith in the efficacy of the standards themselves. In an inter-agency working arrangement between the city planner, the building inspector, and the air pollution specialists, the planner should recognize that he may offer helpful suggestions as to objectives but that the research needed to draft the standards

and design the measuring devices is outside his field. In addition to his major responsibilities, the pollution expert should direct efforts to educating the public on what is practical to do at the present time in establishing more widespread use of effective air pollution control measures through zoning.

Dacy, G. H. Harnessing the Sun for Healing the Sick. Tycos, Taylor Instrument Cos., Vol. 21, 1931, p.5.

Medical reports show that more than half of the children in England who have attained the age of 3 years are afflicted with rickets, a life-crippling disease of darkness. Weather conditions in the English cities combine with the smoke nuisance, fogs, and other barriers to block off sunshine with its healthful ultraviolet rays which build bone, quiet the nerves, increase the red corpuscles in the blood, and facilitate calcium and phosphorus deposition in activating man with the sunshine vitamin, notably, vitamin D.

London, for example, burns more than 3,000,000 tons of coal daily for both domestic and industrial purposes. Because of inefficient use of this coal supply, only about half of it produces heat, while the balance pollutes the atmosphere with smoke, soot, and other by-products of fuel consumption. Experiments conducted by the British Sunlight League have disclosed that as much as 800 tons of foreign materials occur in 1 square mile of air area above London in the course of 12 months. Conditions are so bad that large amounts of coal dust and even particles of coal are found frequently in the lungs of those who die from respiratory diseases and similar ailments.

Children raised in this smoky atmosphere, where the sun is veiled for days at a time by smoke, soot, and fog, are naturally sickly. The British Sunlight League, organized in 1926, seeks to curb such sacrifice of human health and life by the enactment of laws that will substitute gas, oil, and electricity for fuel in place of coal. This organization also is fostering sunlight research throughout England and is father of regulated sunlight bathing and the establishment of health centers and sanitariums where young and old are cured of disease by heliotherapeutic and heliohygienic treatment. The campaign has also been successful in obtaining the official consent of the authorities for the use of certain areas in the public parks for sun-treatment purposes.

Danis, A.L. "Site Selection and Meteorological Control" University of Florida, Florida Engineering and Experiment Station, Gainsville "Atmospheric Pollution"....Bulletin Series No. 83....September 1956. p.33-38

In order to choose a proper plant site one must consider macro- and micro-meterological information, topography, location of population, diffusion

characteristics. Meteorological considerations include a) wind and temperature information, b) periods of calm and light winds, c) wind structure in the vertical, d) temperature gradient in the atmosphere.

Delbruyere, Robert, "A Commended Solution of the Problem of Air Pollution" International Clean Air Conference Proceedings, London, October 20-23, 1959, pp. 74-75, (Contribution of Brussels, Belgium)

The article states that green areas should be planned to filter out air pollution, and that these areas should vary, according to the district and density of population from thirty-five to sixty percent of the total area. It is felt that green areas are the only means for overcoming the pollution of air caused by human and animal life.

(NOTE: The article seems to be too impractical and too emphatic on its green area proposal with little or no mention of scientific evidence to support the positive effects of green areas on filtering air pollution.)

Frenkiel, F. N. "Atmospheric Pollution and Zoning in an Urban Area", Detroit, May, 22-26, 1955 APCA National Meeting.

The principle of "air zoning" is thoroughly examined. The problem of air zoning is to limit the amount of atmospheric pollution which can be tolerated at various parts of the surface of an area. In a populated community such limitation may be based on health requirements, nuisance level, visibility, etc. If the air zoning requirements take into account the differences between the nature of possible damages in each of the locations, then the allowable threshold concentration may vary with the location. If concentration goes above certain threshold at a certain time of day, we might, for example, change the hours of operation of incinerators to shift their pollution concentrations to other hours.

Geiger, Rudolph "The City Climate" in the Climate Near the Ground (Cambridge, Massachusetts, Harvard University Press), 1957

The entire book consists of excellent information on microclimatology, especially on surface temperature differentials within metropolitan areas. There is one chapter, "The City Climate" that is particularly pertinent. There is a brief description of the Leipzig study as studied by A. Lobner. According to him, three dust layers, one above the other, can be recognized in a great city. The lowest, which lies between houses and on open spaces is caused by

street traffic and railway smoke. A second layer which is fed by chimneys lies above the houses, about 20 m. from the ground. Above this, at a height of from 50 to 60 m. is a third, which is caused principally by factory chimneys. The two upper dust layers increase the dust in the street air only when there is rain and fog. There is some discussion on the effects of green areas in filtering out pollution.

Goldberg, M. S. The Sanitary Protection of Air Medgiz - 1948 - Moscow, "The Sanitary Classification of Industrial Plants and Sanitary Clearance Zones" (Found and translated in B. S. Levine U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol.4)

There are classifications of all types of industry and respective requirements for sanitary clearance zone widths. General classification is broken down into (1) chemical manufacturing plants, (2) metallurgical, machine building and metallic processing industries, (3) mining and other natural mineral resources, (4) plants of the building industry, (5) plants of the wood processing industries, (6) textile manufacturing, (7) industries engaged in the products of animal origin, and (8) food products processing and spice manufacturing industries. Within each general classification there are sub-classifications with clearance zone requirements ranging from 100 to 2000 meters in width.

Graham, J. "Clean Air-The Relationship Between Land Use Planning and Air Pollution" Journal of the Town Planning Institute, June, 1957

This comprehensive article on the relationship between air pollution and planning focuses on the relative success of the "smokeless zones". In the "smokeless zone" law, all industrial, commercial and domestic fuel-burning installations are to adopt the best contemporary means for thoroughly efficient combustion and thereby smokeless as far as is practicable. The first smokeless "central area" (in Manchester) was followed by 3 marginal extensions, together with five smaller zones in clearance areas about to be redeveloped; slum clearance was logically correlated with clean air policy. The typical ring of industrial towns with a mixture of unfit housing and industrial property, forms a distinct barrier to expeditious expansion of central smoke control areas. In such circumstances the rate of conversion to smokelessness so far as houses are concerned will be determined largely by the rate of slum clearance and redevelopment and the practicability or otherwise of bringing particular industries under the prohibition of smoke emission. Assuming that the prevailing wind direction is southwest and subject to no serious embarrassment from the situation of heavy industry in that direction the south-westerly municipal boundary for smokeless zones suggests itself as the datum line from

which to establish successive zones downwind. During the winter of 1952-53 (just after certain conversions were made obligatory), the reduced fall of heavier particles of local pollution was most noticeable and it was estimated that 168 tons per year were no longer emitted from premises in the area. Further, there seemed to be less mist or fog in the central area than immediately outside it. The cleaner warm air currents in the zone acted on the moisture-laden air.

Graham, W. E. "The Influence of Microclimate on Planning" Planning Outlook, Spring, 1949, pp. 40-52.

There are presented some basic concepts that relate microclimatology to land use; however, there is little focus on air pollution per se. In relation to topography, it is stated that where there is a small trough of land with a difference of 25 feet between the crest and the lowest point, it is found that on a clear windless night the temperature of the lowest point is found to be 11°F colder than the crest, with the relative humidity 20% higher. Nightfall causes the heavy cold air to drain to the bottom of the valley, and on many mornings a thin sheet of fog would form there. In daytime, and especially in summer, these conditions are reversed. The hollow will be 4° or 5° warmer and the humidity 10% lower than that of the slopes. Consequently - a trough accentuates extremes.

On cloudy and windy days the temperature tends to become uniform, and in addition the crests are exposed to the wind more than the bottom of even the least depression. Hence, in winter, buildings on the top of a rise will require much more efficient draught - proofing and a great deal more heating than those in the valley. When the difference is 200 feet, this may become a marked factor. It is apparent that exposure to the wind may offset the higher temperature of the hilltop, and a house on the crest may lose three times as much heat as one in the valley below. This factor is again varied by the presence or absence of shelterbelts or a situation on the lee side of a hill just below the crest; for in both cases the effect of the wind is mitigated. Conversely on a windward slope the bad effect is comparable to, or even worse, than that on the crest.

The lee side of a body of water tends to have a less extreme climate than the windward side. The ability of water (whether salt or pure) to hold heat tends to raise the lowest temperatures in winter unless the water is completely frozen over. In the warm seasons, through evaporation and retarded thermal change, water tends to lower the highest temperatures and in addition it raises humidity in its immediate vicinity. Water, although it takes longer to heat up than land, has a greater thermal capacity. Thus, the breeze is caused by air moving from the cooler sea to the heated land in daytime, while at night the position is reversed as the land cools quickly and the sea retains its heat; therefore the flow of air is in the opposite direction. The

stabilizing effect of water bodies on temperature is, however, a phenomenon of small dimensions, but even around large continental lakes the off-shore breeze on many hot days will lower the maximum temperature by as much as 10 degrees.

The construction of the soil has a decided bearing upon microclimate. Sand and gravels cause higher temperatures, while loams and clays tend to lower temperatures. The former lower humidities and the latter increase humidities. This cannot be proved by recorded figures, but on reflection one realizes that the temperature of sand is always higher than other soils, while under usual conditions it is drier; the scientific basis for these assumptions being that wet bodies tend to give off moisture while dry bodies tend to absorb moisture.

Not only does the heating have its own effect, but the texture of the city, as opposed to the natural landscape cuts the wind velocity to about 60 percent of that over the open country.

The skyscrapers proposed in Le Corbusier's theoretical City, would be comparatively free of adverse microclimatological conditions since buildings stand in open landscaping. It is felt that the vast areas of concrete interspersed throughout the city could however be detrimental to the microclimate in general.

Plans & diagrams are included.

Guinier, P. APCA Abstract No. 4633 (The Pollution of the Atmosphere and the Forest) La pollution de l'atmosphere et la foret. Rev. Association Preven. Pollution Atmospherique (APPA) (Paris) 2,363-5 (October - December 1960)

The trend of modern city planning is to provide for areas of greenery. As populations increase and cities become larger, more areas of wooded pathways are being provided for purposes of repose and relaxation. In speaking of the effects on such wooded areas of automotive exhaust fumes, the author mentions the lack of, or rarity in occurrence of, conifers in the heart of Paris and the poor condition of the chestnut trees there. Conifers are especially susceptible to injury from exhaust fumes. Maple trees are more resistant than are the elm or ash trees. Such injuries from automotive exhausts are also being seen in the large forested areas such as Fountainbleau. The pleasures of the populace and of visitors and tourists of seeing beautiful vistas of naturally wooded areas, such as those of mountain valleys in the Alps, are being disturbed by the presence of clouds of stagnant fumes which have been emitted into the air. In the industrial area around Rouen, injuries from sulfurous gases are being seen. In the Maurienne valley, more and more trees are dying as the result of emissions

of fluorine into the atmosphere. Economically the loss of trees from air pollution damage is a real item and in areas which are being denuded, soil erosion becomes a factor.

Halliday, E. C. and Kemeny Etel, "The Effect of Sunrise and Sunset on the Concentration of Atmospheric Pollutants" International Journal of Air and Water Pollution, Vol. 8, No. 1, January, 1964

The morning and evening maxima of atmospheric pollution, observed at many places over the surface of the earth, can be explained by a hypothesis which states that the production rate of pollutants increases slowly in the hours before sunrise, falls to a slightly lower value during the day, and then decreases to a low value during the night, and that the rate of dissipation of pollutants increases very rapidly to a high value within an hour after sunrise and decreases to a low value about one hour after sunset.

It is suggested that this process is a regular diurnal process which plays a major role in affecting the changes in concentration of pollutants which are observed.

Harriss, Lynn M. F., "Air Pollution and the Greek Experience", Landscape Architecture, April, 1963, p. 222.

Pollution is detrimental in our "pursuit of happiness", because it decreases the amount of sunlight that can be enjoyed. Harriss refers to Bowra's book on "The Greek Experience", which states that "what matters above all.... in the commanding beauty of Greece....is the quality of the light." It is stated that unlike other European countries, the light is brighter, cleaner, stronger; such a landscape and such light impose their secret discipline on the eye and make it see things in contour and relief rather than in mysterious perspective or in flat spatial relations. From an architectual standpoint, then, it is felt that air pollution has definite adverse effects.

Hawkins, J. E. and Nonhebel "Chimneys and the Dispersal of Smoke" Journal Inst. Fuel, v. 28, November 1955: 530-545 DLC (TP 351.16,v.28)

It is necessary to choose minimum heights of chimneys and exit velocities of flue gases which are related to the height of the surrounding buildings, diameter of chimney, and local ground contours to avoid parts of a smoke plume being blown rapidly to the ground by local disturbances of the wind.

Hentschel, Co. "Aspects of Atmospheric Hygiene As Applied to the Layout of Industries and Residential Districts. (Lufthygienische Gesichtspunkte fur die Anglage von Industrien and Wohnbezirken). Energietechnik (Berlin) 8,491-94 (November, 1958) APCA Abstract, 4, No. 10,2225 (March, 1959)

Examples of zoning according to specific meteorological conditions in each area have been worked out for Leipzig, Karl-Marx-Stadt, Chemitz, and Berlin. Recommendations are made for hypothetical situations; an industrial plant in a central - European valley and an industrial city in the central - European plain. The author advocates thorough research of existing atmospheric conditions combined with the use of the most appropriate abatement measures. Careful planning of sites for residential districts or industrial plants in accordance with ground-level atmospheric conditions is to be preferred as the best and most economic method of air pollution control. There is no equivalent substitute in modern technology at this time (APCA).

Heller, APCA Abstract No. 2989 (Problems of Air Pollution to be Considered in City Planning) Factagung des Stadtetages Nordrhein-Westfalen uber Massnahmen zur Reinhaltung der Luft in Stadten, Jan. 8, 1958, Wuppertal. Stadtehyg. (Uelzen) 10, 58-59 (March, 1959)

The author states that the differentation must be made between immission (Aussenluftuntersuchung) and emission(Schornsteinauswurt). Immission, because of ever-changing wind direction, is difficult to evaluate. Emission sets free a dust cloud which from the standpoint of control, can become serious. In planning for the erection of such structures as hospitals, sports stadia, etc., the condition of the atmosphere should be considered and the building planned for the less heavily contaminated areas. The shape and kind of dust are important since the fall out of dust depends a good bit on these things. The SO_2 output from boiler installations and other places such as sulfuric acid factories, is a factor. Injuries in such areas have been noted by doctors and botanists. The determination of limiting values for air pollution is difficult. Studies made in a closed room are not comparable to emissions out of doors. The latter change quickly, such as the transition of SO_2 to SO_3 by neutralization of the acid gas by the alkaline dust. Meteorological factors, through wind direction changes and turbulence, quickly change the concentration, Further changes come through the action of relative humidity, mists, thermal layering, and precipitation. For investigation of the SO_2, SO_3, and chlorine content of out-door air, various metering devices are suitable. Devices are available which analyze exponentially the content of SO_4 over a period of 100 hours. Sulfur in the amount of 30 mg. is usually without effect; 50 mg., weak; and 100 mg., clearly injurious to plants and a burden to man. Studies can be made similarly, using lead acetate, of the air content of H_2S. Injury from dust is to be expected when the emission is over 3 kg./100 m^2/month. The botanist can demonstrate the injury in tests of the phaeophytin of the plant.

Hendricks, Robert W. "Residential Amenities Along Freeways", Residential Appraiser, June, 1960, pp. 2-10.

The article primarily deals with the effects of a vegetative cover on filtering noise, but there is reference to a study in West Orange, New Jersey, where property values were not lowered as much when a highway is depressed and has a green buffer. On the whole, however, there is hardly any applicability to air pollution control.

Herring, Frances W. "Bases for Urban Development: Air, Soil, Water" Planning, 1963 (Chicago: American Society of Planning Officials, 1963) pp. 32-56.

Herring suggests the need for a new planning tool, ie: maps showing hourly airflow patterns over an area. There is also need for planners to secure maps of airsheds and suggest zones with good receiving air characteristics as the best location for certain industries, and recommend the best sites for new towns and for their zones of industry, of recreational or agricultural open space, of residences.

Herring, Frances W. "Effects of Air Pollution on Urban Planning and Development" Proceedings of the National Conference on Air Pollution, pp. 190-199, (Public Health Service, 1962)

Emphasis is placed on the fact that air pollution in a region is function of areal activities and weather conditions. It is stated that knowledge of such factors as wind directions and speeds, windflow patterns as affected by large land features, amount and times of precipitation, and daily and seasonal amounts of sunshine, permit the tracing of air sheds or meteorological - topographic districts on maps already recording land use, population densities, traffic flows, and other demographic data.

There is a discussion of the effects of the concentration and de-concentration of industry on air pollution. With a view to thinning down mass emission loads, de-centralization of industrial plant location may be advisable, or where meteorological factors and the location of urban communities indicate, concentration of industrial plants to the leeward of all inhibited spots may be a solution.

Hess, R. W. APCA Abstract No. 1832, Air Pollution Control Law, Industrial Wastes 3, 35-37 (March - April, 1958)

Controls may vary according to area and varying nature of humane activities in different areas. Controls are based on atmospheric conditions, taking into account topography, meteorology, duration of atmospheric condition, etc. of each area involved.

Hilberseimer, L. The Nature of Cities, (Chicago: Paul Theobald & Company, 1955), 286 pp.

Hilberseimer discusses alternative development types that are possible under certain conditions of air pollution. He states that when prevailing winds are so distributed that the section of pollution does not exceed half a circle, a ribbon like settlement is possible; if it does exceed half a circle, only fanshaped settlements can be formed.

He also presents the concept of setting aside every fifth block in grid-pattern cities, for green space, which could lend themselves to some decentralization of "clean" industries, and for office buildings, theaters, and other centers of culture in neighborhoods.

To protect Chicago from air pollution, it is proposed that manufacturing industries which, by their very nature, pollute the air be located outside of the city, east and west of the Fox River and along the Illinois River. Industries related to these factories could be placed here also. The residential areas for these plants would be situated in a triangle free from air pollution because of the wind pattern. The heavy industries in South Chicago and Gary would be left in their present positions. They should, however, be broken up and interspersed with firebreaks for their protection. The residential areas for people working in these mills would be so placed as to be free of air pollution. They would have to be connected with the industrial plants by mechanical means of transportation. (See p. 253).

Hill, L. The Obstruction of Light by Smoke and Its Effect on Health. Medical Officer, Vol. 56, 1936, pp. 213-215.

To demonstrate more fully the need for the elimination of smoke and air-borne dirt, the general physics of the sun's radiations as they reach the earth and their effects upon man are reviewed. Ozone, clouds, and haze by absorption modify the radiations that reach the earth. The remaining radiations of physiological importance are greatly modified by the smoke pall from cities and, again, by the physical nature of the surfaces on which they fall. Thus, white plaster has a

high reflective power for all rays of the sun. Sand has a high reflective power for infrared rays, while snow and green fields have a small reflective power for these rays.

Sunlight has a wonderful curative effect on wounds and is valuable for certain skin diseases. Incipient boils and carbuncles may be checked by strong doses of artificial sunlight. Sunlight and open-air treatment are of great value in the treatment of tuberculosis, but great care must be exercised in applying ultra-violet radiations in the treatment of tuberculosis of the lungs.

Recent researches have shown that the air tubes of the lungs are narrowed reflexively by way of the nerves when the skin is irradiated with dull-red or dark heat radiations; this effect is counteracted by cooling the skin with a fan and in many instances by rays from a bright source of heat.

Hitchcock, Lauren "Some Scientific Aspects of the Urban Air Pollution Problem" Scientific Monthly, (July, 1955)

Dilution of the source is discussed. Air contaminants reach their maximum ground concentration at distances about ten times the stack height. At this distance, concentrations vary inversly as the square of the chimney height. Thus, increasing the height of stacks or increasing the discharge temperature of gases can be effectively employed in areas not subject to prolonged inversion periods.

In regard to land use, it is suggested that an acceptable level of contamination should be determined. The land then should be occupied by a density of sources per acre to allow for acceptable concentration of pollution per acre.

Holland, W. D.; Hasegawa, A.; Taylor, J. R.; Kauper, E. K. APCA Abstract No. 2990. "Industrial Zoning as a Means of Controlling Area Source Air Pollution" Proceedings of 52nd Annual Meeting APCA, Los Angeles, California, June 21-26, 1959, 22 p.
Also found in Journal of Air Pollution Control Association, (April, 1960) pp. 147-155.

A discussion is presented of the zoning process in relationship to the control of air polluting substances that are not fully susceptible to abatement at the source. Depending on the sufficiency of supporting data, zoning would permit, limit, or prohibit industrial growth affecting broad areas. Zoning for the reduction of air pollution should be on a metropolitan basis and be superimposed on the local industrial zoning plans of the governmental subunits within the area. Metropolitan industrial zoning should be justified by an objective criterion of dilution capacity. The dilution capacity depends on the wind flow,

turbulence, and vertical mixing and is expected to vary with area and time. To maximize the use of the limited dilution capacity - source density, timed release of contaminants and specifications of raw materials or processes can be regulated by zoning. Research is needed on the following phases of the industrial zoning program: 1) The pattern of natural dilution capacity, 2) The determination of community air standards, 3) The forecasting of the location of future source emissions, 4) The classification of industries for air pollution potentials, and 5) The adequacy of coverage of air monitoring sta ions.

"If and If and If - Carless Zones Again", Smokeless Air, Spring 1964, No. 129 p. 201.

Justification of excluding cars from "clean air point of view" is just beginning. There should be a drive for creating in suitable parts of towns, villages, and places of recreating, areas in which all engined traffic would be barred. The article discusses a proposal by Robert Harling in the Sunday Times (January 12, 1964) for converting Leicester Square, including 3 streets that lead from it, into an oasis free from traffic.

"The Image of the North" (Editorial) Smokeless Air, Spring, 1963, No. 125

The article discusses the psychological effects of air pollution. The article suggests that air pollution gives certain areas in England a "bad image", and that more important, air pollution is a psychological deterrent to new industrial location. Reference is made to the "depressing tenacity". It is stated that in the eyes of the South there has always been an image of the North as being dark, dour, and dirty. If this is strengthened, then it becomes increasingly difficult to attract to the North the new industries, the capital, and most important, the keen younger generation of technicians and trained executives.

Ingram, William T. "Place of Performance Standards in Planning and Zoning Regulations" Journal of the Air Pollution Control Association, 12, 62-63 (February, 1962)

It is the intent of this paper to suggest that performance standards relating to process emission do not belong in zoning regulations, but that consideration of the factors affecting neighborhood and area air pollution are related to conservation of the air resource and therefore must be considered in any conprehensive planning program.

Isaac, P. C. G. "Current Lines of Attack on the Smoke Problem in Britain" Archives of Industrial Hygiene and Occupational Medicine, V. 8, September 1953:212-218, (DLC (RC963.A14,v.8)

Since early in the 1950's large areas have been designated as "smokeless zones" where all fuel must be burned smokelessly. For larger installations, use of bituminous coal is permitted, but for domestic users, the use of smokeless fuels such as coke, low-temperature-carbonized fuels, gas, or electricity is required. Owing to the fuel shortage in Britain, the problems of fuel economy and prevention of smoke pollution are closely bound together. Heating engineers are turning to plans for district, or large commercial area heating.

Jackson, J. B. "Our Unexplored Surroundings" Landscape Autumn 1958 pp. 26-28

The article generally states that both indoor and outdoor artificial climates are being created. Built up areas, on the whole, have resulted in greatly decreased sunlight, lower humidity, temperatures higher on the average than those in open surroundings, lower wind velocities, and greater air pollution. The article states: "We know that urban climate can be modified by the intelligent introduction of greenery, by efficient spacing of structures, by regulating the uniformity of building heights on certain streets, and by wise locating of industrial districts. But what we do not know is how to design most effectively with these modifications in mind - nor how to design so as to emphasize the more desirable aspects of the urban climate."

A good bibliography is included at the end of this article.

Kalyuzhnyi, D. N.; Kostovetskii, Ya. I.; Davydov, S. A.; Aksel'rod, M. B. "Effectiveness of Sanitary Clearance Zones Between Industrial Enterprises and Residential Quarters: Gigiena i Sanitariya No. 4 1952, pp. 9-12, (Translated by: B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases) Vol. 4, Distributed by U.S. Dept. of Commerce Office of Technical Services.

This article gives a very good insight into the effect of a green area on reducing both SO_2 concentration and also dust, since it attempts to isolate vegetation from the distance that's involved. Studies were made in the vicinity of ferro-metallurgical plants. Data indicated that concentration of air polluting substances decreased with the distance from the factories as a result of the air purifying effect of the sanitary clearance zones. Averages showed that the concentration of sulfur dioxide outside the green strip at a distance of 500 meters fell from 0.27 to 0.14 mg/m^3 or, approximately 48%, and inside the green strip it fell from 0.27 to 0.08 mg/m^3, or approximately

70%. The same was observed for hydrogen sulfide. If the content of sulfur dioxide and of hydrogen sulfide present in the air outside the sanitary clearance zones is taken as 100% then the amount of sulfuric compounds taken at 500 m. from the initial point fell to 51.8 - 42.8% in the sanitary clearance zone free from plant life, and to 15.7 - 29.6% in the green (fully developed) sanitary clearance zones. Thus, the results showed that the decrease in atmospheric air pollution by sulfur dioxide and by hydrogen sulfide was the result not only of distance from the industrial discharge, but also plant life capacity to retain air pollution.

Also the concentration of nitric oxide at 500 m. from the initial point was reduced to approximately 50% due to distance dispersion alone. At a similar distance and after having passed over the green sanitary clearance zone, the nitric oxide concentration was reduced to 33%.

In brief, results of atmospheric air studies in the vicinity of chemical and metallurgical plants demonstrated that dust, sulfur dioxide, hydrogen sulfide and nitric oxide were absorbed from polluted air by suitable types of plant life to a considerable degree. It is recommended that in creating intervening sanitary clearance zones provisions should be made at the same time for planting in such zones suitable trees and other types of plant life.

Kalyuzhnyi, D. N. and Kostovetskii, Ya. I. (Ukraine Institute of Community Sanitation) "Planning and Effecting Sanitary Clearance Zones in the Ukraine" Gigiena i Sanitariya, No. 7, 9-12, 1952 (Translated and Found in B. S. Levine, U.S.S.R Literature on Air Pollution and Related Occupational Diseases)

The creation of sanitary clearance zones between industrial establishments and residential sections for the protection of atmospheric air of residential sections against pollution with industrial emissions has been widely used in the reconstruction of old and building of new towns and workers' settlements.

When the abatement of harmful effects of industrial by-products on the population was technically impossible, the State Sanitary Inspector may demand enlargement of the existing sanitary clearance zone to not more than twice the prescribed width. Where efficient measures for eliminating industrial by-products are in effect, the sanitary clearance zones may be decreased in size. Such flexibility of the law is of particular value since, on the one hand, it empowers the State Sanitary Inspector to decrease the size of the clearance zones, depending upon local conditions, while, on the other hand, it encourages industrial establishments to develop and install more efficient equipment to minimize industrial air pollution by emissions.

Katz, Morris "City Planning, Industrial-Plant Location and Air Pollution" in Air Pollution Handbook, edited by Magill, Holden, Ackley, 1956 McGraw-Hill: New York.

There are fifty pages of extensive, yet concise, information on the relationship of air pollution control to zoning, industrial-plant location, meteorology and topography. In various case studies of communities relationships are drawn between blighted areas and areas having heavy pollutant concentration. (ie: Pittsburgh, Los Angeles). There is consideration given to the green area concept as an appropriate control measure, both as a means of separating by distance one type of land use from another, and as a means for decreasing density as a means to prevent overcrowding of sources of emission. There is somewhat detailed information on studies that include diurnal variations both in pollutant concentration levels and in meteorological conditions. Basic principles of control in stack design are also discussed.

Kauper, Erwin K. and Hopper, Charles J. "The Utilization of Optimum Meteorological Conditions for the Reduction of Los Angeles Automotive Pollution" (March, 1964) Presented at Air Pollution Control Association Conference - June, 1964.

The paper offers a new concept to the control of pollution from automobiles - regulation of traffic patterns. There is the proposal that the workday be shortened to 7 or even 6 hours, beginning at 10:00 A.M. during the summer season. Because the traffic peak occurs now about 7:00 A.M., the auto emissions are mixed through a very small atmospheric volume where there is a high rate of reaction to form photochemical smog. By 10:00 A.M. the mixing volume would generally be about 7 times greater and the pollutant concentrations correspondingly lower. If the returning - home traffic peak occurs before 5:00 P.M., the authors have calculated that the oxidant concentrations would be up to 54% lower than now observed. Changing the summer time peak traffic hours by delaying the morning rush by one hour will result in an oxidant concentration improvement of 24% for an 8 hour day.

"Kitimat - A New City" Architectural Forum (July, August, October, 1954) pp. 128-147, 120-127, 158-161.

The article generally deals with all the major concepts that went into the making of this new town in British Columbia. Air pollution control was one, but not a major consideration. The requirement for rail connection, direct access to navigable water, protection from flood and assurance that the townsite not be subject to smoke and fumes from the industries - all favored the general area on the west side of the flood plain northward from the head

of Kitimat Arm. Mention is made of microclimate study and on-the-spot observation of smoke movement, which were undertaken at the outset. It was found that smoke very rarely carried from this area over the townsite. When not taken south down the arm, it hugged the western slopes of the river valley and passed by the townsite. Climate inversions would be rare and of short duration.

Street pattern, wherever possible, was designed to break up wind and drifting snow. Diagonal alignment to the prevalent north and south winds was the preferred rule.

Kononova, V. A. APCA Abstract 4848 (Conserning the Basing of Sanitary Protection Zones between Residential Districts and Storehouses with Combustibles) K boprosu ovosnovaniia zony sanitarno - zashchitnogo razryva mezhdu zhilym sektorom i skladami goriuchego V sovkhozakh saratovskoi oblasti. Gigiena i Sanitariya (Moscow) 23, (6) -- 11-14 (1958)

The purpose of this work was the collection of data on which it would be possible to base scientifically the necessity of creating sanitary protection zones between residential blocks and storehouses with combustibles. As a result of the investigations performed in 7 new sovkhozes (state farms), it has been discovered that the atmosphere is polluted with hydrocarbons, tetraethyl lead, and resinous substances up to a distance of 100 m. and the soil to a distance of 50 m., from the storehouses with benzene.

Kuhn, E. APCA Abstract No. 5633 (City Planning and Air Purification) Stadtplanung und Reinhaltung der Luft. Staub (Dusseldorf) 23,214-217 (March, 1963)

A method is described for determining the extent of air pollution and its effects on plants, such as, moss and algae. A consideration of the possibilities for auto purification of town air and some points of view for modern town planning is outlined. In this connection the type of town favorable to ventilation, green belts, suitable traffic plan, new type of settlements, and the necessity for climatic investigations are discuesed.

Kuhn, Erich "Planning the City's Climate" Landscape, Spring, 1959, Vol. 8 No. 3, pp. 21-23.

The article presents some good basic planning and climatological concepts which

are applicable for air pollution control. There is special focus on the effects of green areas in filtering air pollution. It is mentioned in general that every move toward the decentralization of the city, every open space, every park or garden, tends to reduce the amount, of dust in the air. Mention is made of two German studies - one where dust particles were reduced 75% over a 600 foot wide green strip (Leipzig), and one where the extent of absorption of carbondioxide by green areas, was measured (Berlin). For the best filtering effect, it is recommended the green areas be planned having a combination lawn and rows of trees and shrubbery.

Ladimer, Irving "Medico-legal Aspects of Air Pollution Research" Archives of Environmental Health, June, 1963, Vol. 6 No. 6, pp. 772-778

The article deals mainly with the legality of using humans to conduct experiments in air pollution. However, there is some mention of the psychological justification of air pollution. It states that consequences of air pollution can be assessed in terms of health, happiness and economics. Although U. S. Courts have been reluctant to decide, without scientific evidence, how far it is reasonable to go to prevent a person or industry from expelling alien substances into the air, they have recognized the importance of psychosomatic effects: "We may never be able to elimate completely the emotional aspects of air pollution, but we do know that smoke, disagreeable odors, industrial soot, and smog have adverse effects on the psychological as well as the physical well-being of populations."

Landsberg, H. E. "City Air-Better or Worse" Air Over Cities (Symposium, sponsored by Department of Health, Education, and Welfare November 6-7, 1961)

Human activity has caused considerable changes in local climates. These modifications in turn have affected the temperatures of the lowest layer of the atmosphere, the diurnal temperature range, the shape of the diurnal temperature curve, the local relative humidity, the local electric field, the patterns and amounts of precipitation, and the speed and direction of winds. These effects have probably only a minor influence upon human well-being. Other changes, however, have potentially harmful effects. The most radical effect has been on atmospheric suspensions and admixtures. None of these changes have been beneficial. The growth of nearly all urban areas and industrial complexes has outpaced the engineering and legal efforts to minimize the nuisance and the possible dangers of contamination. Already the ill winds from one settlement can influence the next town downwind. The day of planning in terms of single communities is over, and whole regional patterns now must be viewed together. Our knowledge of air quality and its

effects on health is not yet adequate. In the interest of public hygiene, an intense effort in biometeorological and medical research is required. (Quoted from p. 1 summary)

The article discusses the relationship of heat to different types of surfaces. Grass and soil lose their heat by radiation rapidly; little heat is supplied from deeper layers. In the city, pavements and house walls absorb a lot of heat during the hours of high sun. After sunset they begin to radiate toward each other instead of against the sky. They are better heat conductors than open land with vegetation. Hence, they can draw on conducted heat from lower layers. Direct heat sources are also involved (furnaces, etc.). Their effect is greatest during the cool hours of the day. All this combines into a slower decline of temperature in the evening, higher temperatures at night, and notably higher minima. This is demonstrated by frequency distributions of country-city temperature differences for the daily extremes. In the simplest orographic settings there is little difference in the daily maxima; the differences are amost normally distributed. In the minima, however, the distribution is normally skewed. Both in summer and in winter there is a high preponderance of excess temperatures in the city, with the largest temperatures noted in winter.

Landsberg briefly discusses the following as positive measures to control air pollution: Creation of open spaces and parklands, avoidance of solid walls of buildings, and construction of buildings of regular heights. All of these counteract the blocking of winds. For the gross dust, shrubbery, trees, and hedges have proven to be good filters and could be used to a much greater extent.

Landsberg, Helmut E. "The Climate of Towns" Man's Role in Changing the Face of the Earth (Chicago: University of Chicago Press) 1956.

The chapter generally compares cities to suburbs in terms of atmospheric radiation, visual range, total precipitation, snowfall, temperature, humidity and cloudiness. Relationships are also shown by city size. It is stated that various measurements of the reduction in total radiation received at the surface in a number of cities as compared to the countryside are in substantial agreement. For the total annual radiation the reduction averages about 15-20 percent. This quantity of energy is partly absorbed and partly reflected and scattered by the dust haze above the city.

Landsberg, Helmut "Microclimatology" Architectural Forum, March, 1947, pp. 114-119.

There is a good examination of certain elements of microclimatology and their general applicability to city planning. Consideration is given to the importance of variations in local topography, to building forms, to water bodies, to forest and park area. It is stated that a 600 ft. wide belt of planting can reduce dust count by as much as 75 percent. However, no reference is made to specific studies that support this fact. Smoke over a city reduces solar radiation by as much as 30 percent, invisible ultraviolet air pollution to 50 percent. Built up city areas cut wind velocity to about 2/3 of the values observed over free terrain.

Lawrence, E. N. "Atmospheric Pollution (SO_2) in Hilly Terrain" International Journal of Air and Water Pollution, January-February, 1962 p.5

The area under study (London), which was fairly evenly surrounded by orographic barriers and distant industrial districts, received concentrations of pollution which appeared to be dependent mainly on atmospheric stability and associated meteorological conditions. It is suggested that stability effects are more evident in hilly terrain where wind dispersal effects are correspondingly reduced.

There is a suggestion that some degree of protection from SO_2 pollution may be obtained by small orographic irregularities in the immediate environs in addition to some protection from major orographic barriers.

Lawrence E. N. "Microlimatology and Town Planning" Weather, Vol. 9, August, 1954, pp. 227-232.

The article gives a fair amount of insight into the effects of urbanization, and the siting and design in relation to microclimatology. It is stated that city temperatures are modified by atmospheric pollution which decreases both daytime insolation and outward radiation at night. A lag in temperature change due to extensive urban masonry intensifies this effect. The night minimum is still further influenced by artificial heating, and observations on the Continent show that minimum temperatures are 1 to 2°C higher inside than outside the city. Midday maximum temperatures, however, are 0.5° C lower inside than outside the built-up area but reduced insolation is compensated for by intensive absorption by walls and roads, the absence of heat loss due to evaporation and the slower rate of cooling. Thus, during summer, late afternoon and evening are often hotter in town than in adjacent districts.

The higher temperatures of towns often initiate an inflow of air from surrounding country, expecially on summer mornings. It is stated by Geiger (1950) that the upward movement of air over cities and the tendency of city air towards condensation can have an influence on precipitation and may be the cause of rainstorms which culminate there. It is said further (Geiger, 1951) that precipitation, in the form of dirzzle, is favored in cities and industrial areas.

Other things being equal, heavy industry should be restricted to outside residential districts in the lee of the prevailing wind. On radiation nights, however, cold air drainage winds may occur and this must be taken into account, for a road cutting not only makes new slopes but also, by controlling the cold air flow, frequently affects the surroundings over a wide area. Where a road embankment interesects the land contours, new microclimates are created by the formation of cold-air dams which may cause cold floods. If a source pollution is involved, air drainage into a valley may have serious consequences on human welfare (Sutton, 1953).

In the process of building towns, new microclimates are continually being formed. An artificial hill of building or mining debris produces new slope climates; railways often change the contours sufficiently to affect cold air drainage; a concrete road modifies temperature, evaporation, run-off and wind flow; and the erection of each house forms a number of varied climates, for the radiant heat which initially reached the natural surface is now shared by walls and roof. The south wall region is hot and usually dry, and in the northern hemisphere receives a larger total radiation on a clear day in January than it does in July (Geiger 1951, etc.) altogether a new combination of climatic characteristics. The north wall, on the other hand, experiences rough, moist conditions, deficient in radiant heat and with traits normally found in areas much nearer the poles.

Asphalt - prepared roofings, and plastics appear to be the main interests of climatological - building research for the near future. Plastics, which are synthetic resins, are highly heat and water resisting, and plywoods bound with plastic adhesives become so water-resistant that they can be used for outside work. Future buildings will probably contain plastics for roof slabs and sheeting, windows, doors, door frames, and other internal uses. "Indeed, it may be possible to establish a new structural method of plastic building technique", dependent on weathering, and of course, on cost and durability. (Townroe, 1946)

References:

Geiger, R. 1950 The Climate Near the Ground, Harvard University Press, p. 367

Geiger, R. 1951 Microclimatology, Compendium of Meteorology, American Meteorology Society, p. 1001.

Sutton, O. G. 1953, Micrometeorology, McGraw - Hill, London, p. 271

Townroe, B. S. 1946, Science and Building, The Practical Building, Odhams, London, p. 429

Leavitt, Jack M. "Meteorological Considerations in Air Quality Planning" Journal of the Air Pollution Control Association, 10, 246-250 (June, 1960)

There is a discussion of the Stalingrad concept. However, it is mentioned that planning in U. S. requires a more sophisticated treatment.

The application of meteorological considerations to community land use planning consists of two phases. The first involves quantitative estimates of pollution patterns from proposed districts marked for industrial development, and the second involves the evaluation of source site suitability in terms of the functional characteristics of receptor areas. The method is demonstrated with Tulsa, Oklahoma, using temperature gradient data from a 215 ft. radio tower on the University of Tulsa Campus and concurrent wind data from the Tulsa Weather Bureau Airport Station for a three month period. In the first phase, radial diagrams were constructed for each of 6 categories of meteorological conditions to show resultant surface concentrations obtained by multiplying computed concentrations at various distance by the appropriate wind direction frequency distribution. Then the concentrations for each of the 6 classifications were added and superimposed on maps of three mile radial receptor areas. In the second phase topography is briefly considered and the land-use of four city districts is discussed. Two of the districts favor more marked industrial development whereas such development in the other two areas in problematical. 10 references.

Linsky, Benjamin, "Air Pollution Control", Planning 1962 (American Society of Planning Officials), pp. 142-143.

Using San Francisco as an example, the article attempts to describe the role between the Planning Commission and the Air Pollution Control District. It is stated that the Air Pollution Control District can help the Planning Commission, in the development of zoning ordinances, including zoning maps (ie: effects of topography and meteorology) and in the issuance of changes of zone and use permits by furnishing specific information on processes as to their air pollution potential.

Luzerne County, Pennsylvania Planning Commission, "Climate, Topography, and Pollution Report," (1962)

There is consideration given to air pollution as part of the comprehensive land use plan for the county. Division is broken down into modified landfill (burning), open burning dumps, incinerators, power stations, burning mine fires, burning culm banks, other burning (other than garbage). There are recommendations to stop dumping and convert or replace by a sanitary landfill, and to locate new utility generating plants away from urban or urbanizing areas, and on the downwind side of them.

Lynch, Kevin and Rivkin, Malcolm "A Walk Around the Block" Landscape Spring, 1959 pp. 24-34

Most of the article generally deals with the impact of certain elements of an urban environment on the psychological feelings of people. In the case study of Boston, there was specific mention that "Where green space (ie: Public Gardens) occurred, there was a universal and very positive reaction of pleasure."

Maga, John A. and Goodman, William I. "The Air Pollution Problem" Environmental Engineering & Metropolitan Planning (Edited by John A. Logan, Paul Oppermann, Norman E. Tucker). (Evanston, Illinois: Northwestern University Press, 1962)

The article states that the relationship of community size to air pollution levels has been affirmed by the U. S. Public Health Service National Air Sampling Network, and that air samplings have shown that the highest concentrations of pollutions generally are encountered in the densely developed areas of the city and rapidly decrease as one moves toward the less densely populated surrounding regions.

There is a discussion of air pollution from fuel use. It is mentioned that certain cities such as St. Louis, Pittsburgh, and Cincinnati, have effectively attached the air pollution problem by restricting the use of soft coal and requiring improved combustion processes. Substitution of petroleum products for coal is an effective solution to smoke problems. But even with a fuel such as natural gas, oxides of nitrogen, a component of the photochemical reaction, will be discharged.

Goodman mentions that an increase in the use of trees and other forms of vegetation should be advocated, but he does not state to what extent the filtration effect of vegetative cover can help to control air pollution.

Markus, Thomas, "Climatology and Architecture" Architectural Review, December, 1960 p. 452-454 Diagrams

This article provides many good concepts, written concisely, on the relationship of climatology to building. When the International Society of Bioclimatology and Biometeorology held their second congress in London early in September, 1960, they included for the first time a working group on urban and architectural problems. Reports of the discussions are included in this article.

The turbulence and funnelling effects of buildings, streets, rising ground and trees can, as shown by Professor Page of Sheffield University, reverse the wind direction through a building from the mean direction as given by the meteorological station at the same moment. 1) A low building in the lee of a tall one will have a negative pressure zone on the "windward" side, 2) hedges and trees create turbulence patterns which can be more critical when they are a middle distance away than when they are close or far, 3) raising buildings on stilts has a sound scientific basis in the tropics to avoid the hot air "roll" that otherwise accumulates at the base of the building, 4) and wind speed (and hence heat transfer) varies considerably over the height of a tall building.

It was stated that night heat losses in tall buildings will be larger on the higher floors than the lower ones; planting on the windward side will increase the humidity of the air coming into the building; concrete pavements on the south side will reflect a considerable amount of solar radiation.

Professor Robinson and M. Peleg, of the Haifa Technical Institute, Israel, stated that the combination of wind, temperature, and sunshine can produce some unexpected results; for instance, where there is a regular increase in wind in the afternoon and evening, rooms with east facing windows may be less comfortable than those with west facing ones, which admit the sun's energy at a time when cooling winds help. In areas where there is little wind, west facing windows cause overheating, since the air temperature is higher when the sun reaches them, and they admit heat into the interior at the same time as the heatwave from the solid east walls also emerges, having been delayed by the construction for 6-8 hours.

Marsh, Arnold, "Why Not Carless Zones?" Smokeless Air, Autumn, 1963 No. 127.

Short article which goes into no depth. It does suggest that perhaps England could follow the example of Venice and Saos-Fee, Switzerland, and set up, here and there, zones or areas or districts in which all motor vehicles are prohibited. Like the smokeless zones, the carless zones could at first be small - selected villages, town centers, around some cathedrals, in areas of historic or national importance.

May, Richard "The Proper Role of Planning and Zoning in Air Pollution Control" 1958 Proceedings of the National Conference on Air Pollution pp. 412-415.

Most of the paper deals with an endorsement of the use of performance standards for new construction, and also the use of standards which vary by district or location within the city. The author states that although it may seem simpler to enforce one standard in a community, there are difficulties in arriving at a single standard which is neither so strict that it cannot be rigidly enforced with respect to some heavier industries or air pollution sources, or which is so lax that it cannot act to reduce emissions from a vast number of pollution sources such as apartment houses, commercial buildings, and light manufacturing plants. Although the paper is relatively short, the point is well taken; a concise argument is made for the use of such standards as part of the effort of integrating zoning with air pollution control.

Meetham, A. R. Atmospheric Pollution; Its Origin and Its Prevention 302 pp. New York Macmillian Co.(1964); New York; Macmillian Co. and Pergamon Press (1956) First Edition published in 1952

The distribution of smoke in a London Park was measured on ten afternoons in March, 1943. It was found that the ratio of the density at the center to the density in the surroundings varied between about 1/4 and more than 5/6. No mention is made, however, of what factors contribute to the decrease of concentration in the park. For example, is it attributed to more than distance itself? It is stated that Hyde Park and Kensington Gardens (each about 1 square mile) are too small to be effective in significantly decreasing pollution; an area must be considerably more than this if there is to be an effective "smokeless zone".

"The Menace of Air Pollution" Planning (PEP) Vol. XX, No. 369, April 16, 1954

The article gives a general description of the adverse effects of air pollution. The article does, however, specifically state the relationship between air pollution and loss of light, and the concept of the "smokeless zone" in England. It states that, as part of evidence to the Barlow Commission, loss of light was given as one of the four principal reasons for the excess of urban over rural mortality. Measurements show that the natural light received in the center or most heavily polluted area of a city may in the winter months be less than 1/2 of that received in the outskirts.

Middleton, J. T., APCA Abstract No. 5499, "Criteria for Certification of Motor Vehicle Pollution Control Devices in California" Journal of Air Pollution Control Association 13, 78-80 (February, 1963)

The motor vehicle control act stipulates that motor vehicle emission shall be controlled for those sources which the State has established standards. The certification of devices to control motor vehicle pollution emissions has been made possible through the adoption by the Motor Vehicle Pollution Control Board Criteria and test procedures. It is estimated that crankcase emission control systems are installed on approximately 10% of the State's 8 million motor vehicles and effect a 2 1/2% reduction in hydrocarbon emissions. Criteria for crankcase emission control systems and exhaust emission control are discussed.

Mills, C. A. "Occupation as a factor in the Community Health Hazards of Air Pollution" American Journal of Medical Science, v. 226, August 1953: 177-178. (DLC (R11. A5, v.226)

This is a continuation of a statistical study in Chicago, Illinois (American Journal of Medical Science, v. 224, 1952:403) intended to aid in clarification of the problem of the community health hazards of urban air pollution. The current study compares the death rates from pneumonia and respiratory tract cancer in the city's cleanest and dirtiest areas on an occupational basis. It is concluded that while urban air pollution cannot be said to be responsible for the increased incidence of lung cancer, it does seem to be one significant factor in this increase. Any factor associated with a doubling of the cancer rate is certainly significant especially when the doubling can scarcely be linked to housing, nutritional state, socio-economic status, or any other environmental factor except irritants in the air breathed. (Author's abstract in part.)

Mills, C. A. "Public Health Aspects of Air Pollution" In California Legislature Assembly Interim Committee on Air and Water Pollution. Final Summary Report, (Sacramento), Assembly of the State of California, (1952), p. 107-111 DLC (TD 425.C315)

The long term hazards of air pollution to community health and welfare are discussed. In 1943 a statistical survey of respiratory deaths in Cincinnati, Ohio and Pittsburgh, Pennsylvania showed death rates for pneumonia, tuberculosis, and lung cancer to be sharply and significantly higher in the dirtier industrial areas of these two cities than in the cleaner residential suburbs. The higher incidences in the male is accounted for by his more frequent exposure to dirty air, and to greater use of tobacco. Doubts that

poor housing conditions account for the higher incidence of pneumonia and tuberculosis in slum areas are raised by the fact that men were more often afflicted than women. It was also observed that there was a similar rise in buccal and respiratory tract cancer. Additional surveys have been completed in Chicago, Illinois; Detroit, Michigan; Nashville, Tennessee; and Atlanta, Georgia. Statistics from Chicago, where the larger population gives a more representative sample, indicate a rise in death rates from pneumonia and tuberculosis from clean to dirty districts which are ten times greater for males than for females; the rise in death rates from buccal and respiratory tract cancer is more than four times greater.

Moureu, H. APCA Abstract No. 4635 (The Various Aspects of Pollution by the Exhaust Gases of Motors of Internal Combustion) Les, divers aspects de la pollution par les gaz d'échappement des moteurs á combustion interne. Rev. Path. Gen. Physiol. Clin. (Paris) 61, 915-931 (July, 1961)

.....It has been established that the level of CO pollution in the public gardens is five times less than on busy streets. Wide avenues and areas of greenery are imperative in control of this type of air pollution. Again the running conditions of the motor are so important in controlling the degree of pollution that they should be under official supervision and inspection. In large cities, especially, the running of motors at an idling level should be reduced to a minimum.

Muncy, Dorothy A. APCA Abstract No. 3479 - "Why Industry Needs Performance Standard Zoning" Journal of Air Pollution Control Association. 10,282-284 (August, 1960)

The use of performance standards in a zoning ordinance is a necessary measure to protect vacant land for future industry. Eight trends in industrial land use are significant to the prevention of air pollution and to the protection of land for future industry; 4 of these trends result directly from industrial management decisions and should guarantee the comparability of future plants. The next 3 trends in suburban growth could handicap industry's efforts to improve its location. The 8th trend in suburban growth illustrates the critical need for performance standards in land use zoning. These trends are discussed in detail. Standards formulated now to guide new industrial growth can be a major preventive measure, until the time when the whole region is protected by a full-scale air control agency.

Munn, R. E. "The Application of an Air Pollution Climatology to Town Planning", International Journal of Air and Water Pollution, 1959 Vol. 1, pp. 276-287.

The article states that in order to minimize urban air pollution problems, it is desirable to include meteorological evaluation in site selection for future industrial development. The complexity of the problem is emphasized, including such non-meteorological factors as population density, permissible threshold concentrations of pollution in relation to length and frequency of exposure, etc.

Brief descriptions are given of the seven ways in which emissions from elevated sources can cause high ground-level concentrations or depositions: gravity fall-out, orographic effects, the classical inversion situation, fumigations, downwash, the looping plume, and precipitation rain-out and wash-out. A reasonable problem is presented: to select from several possible industrial development sites the one that will minimize future pollution problems. It is shown that a theoretical solution, using Sutton's diffusion equations, requires simplifying assumptions and a very complete specification of the microclimatology of the city. The field determination of the parameters would be difficult and costly.

Wind direction frequencies under different meteorological conditions are given for the Windsor-Detroit area. These illustrate in a general way the type of variation to be expected under different stability, wind spread, and precipitation regimes in the absence of orographic and lakeshore effects.

Finally, it is suggested that if one is prepared to accept the frequency and strength of the morning fumigation as the criterion for air zoning, then it is possible to give a crude operational decision for town planning.

(Quoted from p. 276)

"The New City of London Act: The 'Square Mile' to be Smokeless" Smokeless Air, v. 25 Winter 1954: 95 DLC (TD 864.s855, v. 25)

Some of the provisions of Part II of the new City of London (Various Powers) Act, 1954, are outlined. The purpose of the act is to make a smokeless zone of a square mile of the city. After October 2, 1955, no smoke is to be emitted from any premises in the city. The penalty is to be no more than £10, with a daily penalty of not more than £5. Two means of defense are recognized: if the smoke arose as a result of using an "authorized fuel", or if such a fuel were not available; or if the furnace or other appliance had been approved as suitable for any kind of fuel, and the fuel had been burned in accordance with the approved instructions. The term "authorized fuel"

means coke, anthracite or any fuel approved by the common council. The occupant of the premises may be able, under certain circumstances to apply to the Mayor's and City of London Court for financial aid in making alterations The common council may, by resolution, exclude or defer the application of the provisions to any specified premises. Also, the provisions do not apply to smoke emitted from railway locomotives.

Olgyay, Victor Design With Climate - Bioclimatic Approach to Architectural Regionalism (Princeton, N. J.: Princeton University Press), 1963. 190 pp. (Illustrations)

The book provides very good insight into principles of microclimatology that are applicable to city planning. It is stated that plant and grassy covers reduce temperatures by absorption of insolation, and cool by evaporation. This reduction can amount to 1,500 BTU/sq ft/season. It is generally found that temperatures over grass surfaces on sunny summer days are about 10^{o} to 14^{o} cooler than those of exposed soil.

Pavlichenkov, V., APCA Abstract No. 5171, "Experience with Housebuilding in New Siberian Towns" Praktiko novoi zastroiki gorodov Sibiri. Arkhitektura S.S.S.R. (Moscow) No. 2,21-27 (1962)

This is a discussion of the city-planning of some of the new towns in Siberia. Considerable emphasis is placed on the separation of industrial from residential areas, and on the provision for forested areas and zones of greenery, as methods of controlling any atmospheric pollution. The two cities specifically discussed are Angarsk and Shilikhov. The new scientific center of Novosibirsk (where the Siberian branch of the Russian Academy of Science is located) is noted as one where such planning has been well carried out.

Perkins, W. A. "Some Effects of City Structure on the Transport of Airborne Material in Urban Areas" Air Over Cities (Symposium sponsored by Public Health Service, November 6-7, 1961)

Transport of airborne material in urban areas is compared to the transport mechanisms observed and calculated for open areas. The effects of urban areas in modifying general weather patterns are examined, with emphasis on the effects of specific location, size of the urban area, wind speed and cloud cover, and vertical temperature gradient. Meteorological and air pollution surveys conducted in several cities are reviewed, and conclusions based on these surveys are presented. The degree of loss of particulate

matter by impaction on exposed surfaces in urban areas is considered; theoretical and experimental impaction data are reviewed.

It is stated that buildings and other structures increase the surface roughness, thereby enhancing atmospheric diffusion associated with mechanically induced turbulence. In addition, the large number of surfaces within an urban area affords a potential loss of particulate airborne material by impaction processes.

Pincus, S. and Stern, A. C. "A Study of Air Pollution in New York City." American Journal of Public Health, Vol. 27, 1937, p. 321.

The loss of ultraviolet light increases morbidity due to tuberculosis, rheumatic fever, rickets and respiratory infections and lowers the tone and vitality of the populace. In this study all fuel going into New York City for 1934 was analyzed as to type, amount, and distribution, and the types of fuel-burning equipment were summarized. Sootfall measurements were made at stations throughout the city during the year. Measurements of concentrations of streptococci and pollen were also made at various points. The study was made in part to bring up to date the sanitary regulations regarding smoke and air pollution in New York City and to form a basis for long-range planning.(USPHS)

Randolph, Theron G. Human Ecology and Susceptibility to the Chemical Environment (Springfield, Illinois: Chas. C. Thomas, 1962) 149 pp.

The book largely focuses on outdoor chemical pollution in Chicago. It is stated that the greatest source is the petroleum refinery area in Northeastern Illinois and Northwestern Indiana. Another rapidly growing and similar refinery focus is in the area adjoining the ship canal southwest of Chicago. Another more diffuse focus centers about a large paint manufacturing plant on the south side of the city. The fourth area,even more diffuse, centers in the Loop.

There are vertical limitations of outdoor air pollution in the Chicago area. Downtown air pollution is worse at street level and in basements of downtown stores, although there appears to be little difference as far as the first few floors are concerned. Atmospheric contamination as a major factor in the production of symptoms in the susceptible, ordinarily is not troublesome above the 20th floor of Loop buildings. Although present in subways, air pollution there is not as excessive as might be expected because of the

air turbulence.

In a study of patients in Chicago, a patient had no trouble with winds from and direction of blowing at the rate of 15 or more mph. The most troublesome were the "drift" winds from the southeast which blow between 3-7 miles per hour. Another similar drift wind at 5 miles per hour from the south - southwest carried detectable refinery odors from the Joliet region to Waukegan. Four highly susceptible patients in a line corresponding to a "cigar-shaped" shaded area of a fallout map were simultaneously acutely ill between 40-75 miles from the source of this contamination. It may be said conservatively that there is no residential area within a 50 mile radius of the center of Chicago which is free from air contaminants arising from the city and environs.

Although wind direction, velocity and turbulence determine the degree of contamination at any given point, the fact remains that the closer a susceptible person lives to a city's central area, its major routes and "stop" intersections, the greater his exhaust exposures. This statement is based on observation of the clinical effects on patients in many families advised to move from homes adjacent or near diesel railroads, truck or bus lines, expressways and stop-light corners. Some highly susceptible individuals may have their chronic illness perpetuated from such exposures when living within three city blocks of major expressways.

Exposure of passengers on diesel trains to chemical fumes arising from the engine are greatest at points of entrance and exit from such trains. When all common modes of transportation at ground level are considered, the electric elevated train, followed by the electric subway train, seems to be associated with the least pollution. Despite the tendency of certain traffic odors to settle in low places, air turbulence and ventilation in subways usually dissipate most of the odors that collect there.

The tendency for buses to follow each other closely also favors the entrance of exhaust of the lead bus into the passenger compartment of the following vehicle.

Eddy currents induced by the relative vacuum immediately behind a vehicle traveling above a certain critical rate of speed are extraordinarily effective in fouling the air in rear seats.

(p. 58) Persons inhaling excessive amounts of fumes tend to under-react in their ability to make quick decisions and to act on them. But they over-react in the sense that they tend to be easily annoyed by other persons and events.

Resen, F. L. "Why Tall Smokestacks Fail to End Air Pollution Woes in Houston Area" Oil and Gas Journal v. 54, October 3, 1955: 139 DLC (TN 860.04, v. 54)

Smoke stacks have not solved the air pollution problem in the Houston Gulf coast area (Texas). Scrubbers, cyclone collectors, and filters must be used with the stacks. The absence of hills in the area has an important topographic effect since lack of a natural updraft causes stack plumes to roll along the ground, contaminating large areas. Meteorological effects have also caused trouble, temperature inversions occur about half the time and are most severe at night forcing plumes to spread instead of rising into the atmosphere. In addition, the high humidity gives rise to low-hanging fogs which tend to hold the discharged gases close to the ground.

"Road Pollution and Traffic Congestion - A Way to Reduce Both", Smokeless Air, Spring, 1962 pp. 208-211.

The article brings out justification for reducing both pollution and traffic congestion through the use of electric trains. At an Annual Representative Meeting of the British Medical Association, it was brought out that in order to reduce atmospheric pollution, electric vehicles should be used to the maximum possible extent. With electric trains, there is no waste of fuel in idle running or unnecessary wear and tear on the power mechanism. The article states that Moscow is not using diesel engines on the internal bus routes because the engines contaminated the air with exhaust gases.

"Sanitary Standards for Planning Industrial Production Plants" ISP 101- 51 Replacing GOST 1324-47. Field of Application and Basic Requirements for General Planning. (Translated by B. S. Levine (Vol. 6) of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases)

The site of industrial enterprises, or industrial production complexes, which produce such harmful effects as deleterious gases, smoke, soot, dust, unpleasant odors, noise, etc., must be selected by taking into consideration the location of the nearest leeward residential settlement with regard to prevailing winds, and to separate the plant or the complex from the boundary of such settlement by appropriate sanitary clearance zone.

The general plan of the industrial production and [illegible]ing enterprises must include a well-considered plan for executi[illegible]ntenance of the

required sanitary clearance zone, the adequate planning of appropriate trees, shrubs and other green plants, and any anticipated legally permissible utilization of the proposed required clearance zone.

Buildings must be erected with due regard to direction of most effective light and direction of prevailing wind so as to assure most favorable conditions of natural light and ventilation.

It is stated that breaks or clearances between different sections of a production or processing industrial building can be best attained by resorting to pie-shaped or comb-shaped type of building, in which case certain regulations must be observed regarding length and width of space breaks or clearances.

Schmidt,.... APCA Abstract 2991 (Cement Plants and Air Pollution) Factagung des Stadtetages Nordrhein-Westfalen uber Massnahamen zur Reinhaltung der Luft in Stadten, January 8, 1958, Wuppertal. Stadtehyg. (Uelzen) 10, 59 (March, 1959)

In the construction of a cement plant in the vicinity of a metropolitan area, it was planned to permit the emission into the air of 1% of its product. It was also stipulated, that the plant was to be surrounded by a wide belt of trees with undergrowth which would assure an effective clearing of the atmosphere. The conditions prior to the construction of the plant were determined by a series of measurements. This cooperation of the city planners with the industry is given as an example of a desirable condition which should benefit both sides.

Schmutz, George, L. "The Hazards of Residential Locations" Review of the Society of Residential Appraisers May, 1952, pp. 3-8.

The importance of "congruity" is stated as a condition essential to the value of residential properties. It is stated that mixed residential-industrial land uses would not be congruous. The absence of deed restrictions and zoning is a hazard which exists because of the absence of protection from adverse influences, such as possible infiltration or inharmonious land uses, structures, etc. Also, there is sometimes unavailable FHA funds. If mortgage funds are not made available by FHA, then an appreciable portion of the money market is not available and will adversely affect the value of real estate.

Schreibeis, Lee "Air Pollution Control in Urban Planning" American Journal of Public Health, Vol. 51, No. 2 p. 174-181.

The article gives a good description of the work in air pollution that has been

completed in Pittsburgh. Despite an increase in fuel consumption, a concurrent change in the type of fuel consumption resulted in large reductions in smoke and dustfall. At the western tip of the Golden Triangle financial district, sixty acres of blight have been replaced by a thirty-six acre park and a commercial district of seven new buildings in a park-like setting -- -- Gateway Center.

Schreibeis, William, J. and Schrenk, H. H. "Evaluation of Dust and Noise Conditions at Typical Sand and Gravel Plants", Industrial Hygiene Foundation of America.

The article attempts to show differences that can exist between actual accounts of air pollution and the public's perception of the amount of pollution. Dust is a nuisance and no specific level of dustfall can be given as a standard. Since a nuisance represents human response to such factors as dirt, odors, loss of visibility, etc., it cannot be defined in precise terms. Persons who have lived for years near industrial areas accept much greater dustfall without complaints than persons who have lived in rural or suburban areas. Hence, the problem at each plant is an individual one depending upon the proximity of residents as well as upon conditioning of the population.

Schueneman, Jean J. "Air Pollution Control Administration; Planning and Zoning" Air Pollution , (Edited by Arthur C. Stern), 1962, New York: Academic Press

The chapter describes two general aspects of air pollution control: 1) location of industrial areas so as to preserve air quality of the community as a whole; and 2) physical separation between major pollution sources and residential areas to protect the latter from direct fumigation by pollutants discharged by the former. There is a very good outline of the advantages and disadvantages of performance standards. It is stated that the location of industrial areas with respect to residential areas for the purpose of protecting the latter from high concentrations of pollution is a matter involving distance between the two areas; height, velocity, temperature, and rate of pollutant emission; meteorological conditions; and desirable pollution levels to be maintained in residential area or commercial areas.

Schulze, E. E. APCA Abstract No. 3223 - "Performance Standards In Zoning" Journal of Air Pollution Control Association, 10, 156-60,174 (April, 1960)

The problem is whether the performance standard is the best available

planning tool for the purpose of controlling air pollution. The problem of the proper enforcement of a technical ordinance is massive. Before a performance standard is enforced in a zoning law, it should be determined whether the benefit to the community will justify the cost of administration. Prior to commitment of capital in a new area, industry looks to the zoning law for certainty and assurance of its ability to locate in the proposed site.

Scorer, R. S. "The Effect of Thermal Convection on the Transfer Mechanisms in the Atmosphere" International Journal of Air and Water Pollution, 6,101-111 March-April, 1962

When thermal convection over land is the primary cause of stirring motions in the air, it is argued that heat and pollution may be transferred vertically many times (of the order of 20) more efficiently than momentum. The upward transfer of pollution by buoyancy may be accomplished by a negligible downward transfer so that shear will produce less horizontal spread than with other kinds of eddies of the same intensity.
3 figures, 8 references.

Simon, E. D. and Fitzgerald, M. The Smokeless City Longmans, Green and Co., London, 1922

The resultant loss of sunshine through a cloudy atmosphere is said to be detrimental to health because of the loss of its bactericidal effect, its stimulating effects, and its health giving capacities.

Singer, I. A. APCA Abstract No. 2992, "An Objective Method for Site Evaluation" Proceedings of 52nd Annual Meeting Air Pollution Control Association, California, June 21-26, 1959, 13 pp.

An attempt has been made to combine objectively the three technical aspects related to site selection from an air pollution point of view. At present, the distribution of pollution, the distribution of receptors, and the effect of the pollutant on the receptors are considered quantitatively on an individual basis. The distribution of the receptors sensitive to the pollutant must be obtained. The primary factors in a realistic evaluation of a site are ones not directly related to air pollution. These are classified as economic, administrative and political. The final technical problem to be considered is the reaction of the receptors to the pollutant. The technical aspects mentioned can usually be calculated to an acceptable degree of accuracy. The distribution of pollution by means of the diffusion equations can be predicted to several ppm.

and accurately verified with instrumentation of equivalent precision. In this paper the author attempts to formulate an hypothesis that can be used as a starting point in combining the factors of importance relating to an air pollution problem and to develop a rating number that will enable administration to decide objectively upon the relative merits of sites. This model could be used as a basis for zoning regulations.

"Smokeless Zones" Journal of American Medical Association, J. 154, March 6, 1954: 852 DLC (R18-A48,V.154)

"Smokeless" zones in Coventry and Manchester, England, have proved to be very satisfactory. In these zones, emissions of the visible and tangible products of incomplete combustion are prohibited; however, such a gas as sulfur dioxide is not controlled. The heating systems of the buildings in the zones have been modernized, bituminous coal being replaced by electricity, gas or coke. After one year, recommendations for increasing zones were approved.

Summers, Peter W. "Smoke Concentrations in Montreal Related to Local Meteorological Factors" Air Over Cities (Symposium sponsored by Public Health Service November 6-7, 1961)

Smoke concentrations in central Montreal have been measured by Weather Engineering Corporation since January 1960. The seasonal variations are related to the changes in atmospheric stability. Early in 1961, measurements were started by McGill University. Data from the three locations are compared and discussed in terms of the vertical distribution of smoke and local topographic effects. The advantage of a "smokeless zone" is clearly demonstrated. Some synoptic situations producing high smoke concentrations are illustrated. Application of these results to similar locations in eastern Canada and the Northern U. S. with a long winter snow cover is discussed.

It is stated that the rate of ventilation increases sharply after sunrise and more than offsets the big increase in production due to daytime traffic and industry until late afternoon. By late evening the rate of ventilation has fallen off again but is still greater than the rate of production after man's daytime activities have ceased. Pollution therefore falls to a minimum again shortly after midnight.

Summers, P. W., "Urban Ventilation in Montreal", Smokeless Air, No. 128, Winter, 1963

Emphasis is on meteorological aspects of air pollution. Stress is placed on the importance of diurnal inversions. There is greater diurnal variation of smoke in the summer months compared to the winter. The daytime vertical mixing of the atmosphere is severely restricted during the winter months when the ground is frozen and snow-covered. Fortunately, the winds are stronger at this time of the year, enhancing horizontal ventilation and offsetting somewhat the effects of snow cover.

The rate of change of smoke concentration at any given time is only dependent on its value at that time and also that after an elapsed time of several hours the concentration approaches some equilibrium value. This equilibrium value, as would be expected, depends on 1) the rate at which the smoke is being produced, 2) the rate at which it is being removed by the natural ventilating processes of the atmosphere, and 3) the volume of air through which the smoke is mixed.

Taylor, J. R., Hasegawa, A. and Chambers, Leslie A. "Control of Air Pollution by Process Changes or Equipment" World Health Organization, Air Pollution (1961)

The chapter generally describes site selection as an air pollution control measure, the basis for zoning as an air pollution control measure, and applications of zoning to control of air pollution. There is a brief discussion of the "green belt area" principle advocated by planning authorities in Great Britain to separate industry and its emissions from the human perceptors (Howard, 1946), and of the USSR suggestion to remove the inhabitants from an area two kilometers in radius surrounding refineries and other specified industrial activities, thus creating a buffer zone (Goldberg, 1948). Geographical and topographic features are discussed in relationship to industrial location.

Source density is discussed. It is stated that indirect density regulations are available through minimum or maximum year, height, size of site, workers per acre land coverage, and building bulk requirements. Moreover, through public policy, additional means may be used to further the decentralization of industries through assessment, rate setting, and circulation policies.

There is a good bibliography at the end of the chapter, which includes subject matter on planning, economics, industrial development, and air pollution.

Taylor, R. A. APCA Abstract No. 1169, "A Modern Development in Fly Ash Handling" Fuel Economic Review, 35, 83-85, 87-91 (1957)

It is not only required that smoke be reduced to a minimum, but, under Section 6, no new furnace or oven burning pulverized fuel or solid fuel at the rate of one ton/hour or more shall be used unless the plant is provided with approved equipment designed to arrest grit and dust.

"Third Reading - The Commons Sums Up on the Clean Air Bill" Abstract No. 913, Smokeless Air 26, 252-256 (1956)

Division of the whole sphere of pollution of the air into its various sectors and imposing requirements which were appropriate to each of them In 3 of those sectors, full-scale prohibition will be enforced. There is emission of dark smoke, not only from furnaces and chimneys, but also from railway engines and from vessels in ports and harbors. For all new furnaces with substantial rates of fuel consumption or which burn pulverized fuel, equipment to prevent grit and dust emission is an absolute requirement. In the smoke control areas which will be established on local authority initiative under the provisions of Clause 9, the emission of smoke will itself be an offense. The Bill requires that all new furnaces shall be as far as practicable smokeless and the emission of grit and dust from both new and existing furnaces shall be reduced to a minimum.

Tonney, F. O. Hoeft, G. L., and Somers, P. P. Loss of Actinic Intensity in Urban Sunshine Due to Air Pollution. Journal of Preventive Medicine, Vol. 4, 1930, p. 139.

Air pollution cuts off the shortest ultraviolet rays first, thus reducing actinic intensity, which is greatest in the short ultraviolet rays. Erythema range is principally 3,020-2,970 A., which coincides with the antirachitic range.

In the study, cloudless days were used for uniformity, with test stations dispersed about the city of Chicago and control stations outside and windward to the city. Most severe obscuring effects were observed in late fall and early spring. In summer, when combustion of fuel for heating is at a minimum, the loss of ultraviolet light is still considerable. Studies were made over a 3-year period. (USPHS)

Tonney, F. O., and Deyong, C. R. "Smoke Eradication to Save the Health Value of Urban Sunshine" American Journal of Public Health Vol. 21, 1931, p. 344

Studies made in several American cities show a decided loss of the short rays and actinic intensity of the sun most of the year.

Two charts are presented; one shows the "relation of total deaths to erythema hours of sunshine per month in Chicago, 1926-27," and the other the "relation of deaths from acute respiratory disease to erythema hours of sunshine per month in Chicago, 1926-27."

The striking feature of these charts is the remarkable correlation between respiratory-disease deaths and erythema hours per month; low erythema hours are followed by high respiratory death rates with a lag of 1 to 2 months, and, conversely, the higher erythema hours per month are followed by correspondingly lower respiratory death rates, after a similar lag. (USPHS), 1933

Tssyu-Chei, Chjan "Hygienic Basis for the Determination of Standard Sanitary Clearance Zone Widths around Gasoline Filling Stations" Gigiena i Sanitariya, Vol. 24, No. 10, 17-21, 1959. (Translated by B. S. Levine, Vol. 6, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases)

It was found that the degree of atmospheric air pollution and the noise intensity in the proximity of gasoline stations depend upon the number of automobiles served, the volume of gasoline dispensed, and consequently, with the number of gasoline pumping installations. Based on the observations, analyses and other data recorded, it is proposed that the width of sanitary clearance zones be adopted in accordance with the size of the station and the amount of gasoline dispensed. Specific quantitative standards are stated. For example, stations with three pumps and 50 m^3 gasoline tanks and dispensing over 3,000 li/hr. of gasoline, should be surrounded by a sanitary clearance zone of not less than 100 meters wide.

U. S. Public Health Service "Meteorology for Land Development Planning in the Tulsa Metropolitan Area", Technical Report A61 5, 1961 28 pp.

The article provides some good basic principles of meteorology and shows their relationship to air pollution. The purpose of the report is to provide the Planning Commission with meteorological information which will be of assistance to the Commission in setting zoning performance standards. It

is pointed out that strong winds can give adverse conditions just as light winds can, since strong winds which provide relatively large volumes of air for mixing with effluents will usually allow relatively little atmospheric dilution after initial mixup. Therefore, these winds may occasionally carry some of the local industries concentrations into residential and business districts.

Wainwright, C.W.K. and Wilson, M.J.G. "Atmospheric Pollution in a London Park", International Journal of Air and Water Pollution, Vol. 6, 1962, pp. 337-347.

The concentration of atmospheric sulfur dioxide was recorded at a point in Hyde Park, London, and traverses of the park were made with portable apparatus. The rate of decrease of concentration with distance from the upwind edge was found to be closely related to the lapse rate but not to the wind speed. The rates of decrease with distance were greater than those calculated from the work of Lucas, and even large adjustments to his treatment would not make it fit all the experimental results. It is suggested that the discrepancy may be partly due to a current of cleaner air which descends into the park by natural convection.

(Abstract quoted from p. 337)

Weisser, D. (Beratungsinstitut Fuer Gewerbliche Wasserwirtshaft und Luftreinhaltung, Cologne) "Woods as a Natural Barrier Aganist Air Pollution in Areas of Concentrated Industrialization and Urbanization" Wasser Luft u Betrieb, March 1961, Wiesbaden 5, 96-8, (In German)

Woods and parks have an exceptional position in the control of contamination of the air. The filtering effect of foliage and needles reduces dust and detoxicates the air of the industrial waste gases by causing turbulence and deviation of the air-flow. The air in a wooded area is a decisive factor in the oxygen-carbon dioxide cycle which is indispensable for the welfare of man, animals, and plants. Such a wooded area feeds a continuing stream of fresh air, with a high pressure of oxygen, into the air dome pressing upon the concentrated areas of industrialization and urbanization. On the other hand, the woods themselves are subject to the influence of noxious emissions from industrial areas. Conifers have been found to be more susceptible to toxic emissions than are deciduous trees. Therefore, there has been a trend for some time to change to the deciduous types in those trees making up such a wooded barrier.

Wichita - Sedgewick County Metropolitan Area Planning Department, "Pollution: Water - Air" (February, 1961)

There is good elementary information on how climate affects air pollution. Some consideration is also given to economic effects. For example, the worst blighted housing areas were found to be near older industrial districts, which cause a high degree of air pollution. Some multi-purpose benefits of air pollution control are stated such as using sulfur dioxide for making sulfuric acid. Industrial performance standards are discussed as effective positive controls to air pollution.

Wilkins, E. M. "Effects of Topography on Winds and Diffusion Conditions at the National Reactor Testing Station: Journal of Air Pollution Control Association, v.6, May, 1956, 14-16 51/ DLC

The effect of topography on winds and diffusion conditions (ie: mountain-valley breezes, channeling, descending currents, basin effects, large eddy, and zones of wind shear) in the Snake River Plain of Eastern Idaho is discussed. The circulation pattern associated with wind shear phenomena is being studied by means of smoke observation, wind and temperature soundings, and tower instrumentation, the possibility of recirculation of effluent, inherent in mountain valley breezes and standing eddies, of no concern for anticipated operational effluent releases, but must be taken into account for disaster planning. An illustration shows the effect of shear zone on a smoke plume from a 250 foot stack at the National Reactor Resting Station.

Williams, Norman "Implications of the Franklin Institute Study for Planning and Zoning" Journal of the American Institute of Planners, Fall, 1952, pp. 181-185

The establishment of effective control of air pollution will remove one of the primary obstacles to the development of more balanced communities in these outer areas, by making it practical to create substantial industrial areas on appropriate outlying sites without harming near-by residential areas. There is discussion of whether there should be different regulations permitting the emission of different quantities of certain contaminants in different zoning districts. It is thought that stricter regulations may be needed for light manufacturing districts which are increasingly being established near residential areas and that less stringent regulations may be safe for isolated industrial areas.

"Winds as a Factor in City Planning" Landscape, Autumn, 1957 Vol. 7, No. 1. p. 16

This is a very short article dealing mainly with the effects of building forms on winds. Any extensive construction has the effect of modifying winds of medium velocity; all buildings act as barriers to air currents, and particularly where the horizontal profile is irregular. A uniform row of four story houses, for example, does less to interfere with air currents than does a row of low houses alternating with tall ones. The city, in short, has modified its own climate. Lowered wind velocities mean not only higher local temperatures - always characteristic of built-up areas - but that polluted air is not carried away, or at best, drifts over other built-up areas.

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World Meteorological Organization "Windbreaks and Shelterbelts" (Technical Note No. 59) 1964, Secretariat of the World Meteorological Organization, Geneva, Switzerland.

The report deals with the effects of shelter belts and windbreaks on microclimate, soil climate, soil erosion and on plants and animals. The study involves the influence of shelter belts on air flow, the influence of shelter belts on heat balance, the influence of shelter belts on water balance, soil erosion and its counteraction, the influence of shelterbelts on the chemical composition of soil and air, and the biological effects of shelterbelts.

The study states that the main effect of shelterbelts and windbreaks is to reduce surface wind speed. The change in microclimate and soil-climate in plant and growth and in animal life is mostly a consequence of the reduced wind speed. The horizontal range of wind reduction by a belt is proportional to the height of the belt. The percentage wind reduction is independent of wind speed with small exceptions. The permeability of shelterbelts to air flow is the main factor affecting the distribution of wind speed on the leeward of the shelter. Very dense shelterbelts cause a strong reduction immediately behind the belts, connected with eddies and strong turbulence. The distance from the belt at which the free open wind speed is reestablished is relatively small. Behind shelterbelts with a permeability of 40 to 50 percent the zone of wind reduction is the most extensive. The minimum of wind speed is at a distance of 4 to 6 times the height of the belt. The degree of wind reduction by shelterbelts of different widths depends chiefly on their permeability. Other factors influencing the wind reduction by shelterbelts are the roughness of soil surface and the stability of the air. The range of wind reduction increases with decreasing surface roughness and with increasing air stability.

The layout of shelter belts depends on their purpose. Furthermore, consideration must be given to the proximity of adjacent belts as several

parallel belts produce an effect different from that of a single isolated belt. The question of optimal spacing cannot be easily answered, since it depends on many factors. Very frequently a rectangular network of shelter-belts gives the best wind reduction because of the variation in wind direction. (Excerpt from Summary pp. VII-VIII)

Yanysheva, N. Ya. "Basic Data for the Determination of Sanitary Clearance Zones Widths Around Peat Burning Electric Heat and Power Stations" Gigiena i Sanitariya, Vol. 24, No. 9, 6-10, 1959.
(Translated by B. S. Levine, Vol. 6, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases)

The hygienic evaluation of data related to atmospheric air pollution and to width of sanitary clearance zones was based on a comparison of the actual maximal single concentrations with the limits of allowable concentrations adopted in the USSR for dust (0.5 mg/m^3) and SO_2 (0.5 mg/m^3). Of equal weight and importance were the answers to a list of questions given to local residents which in this case were in close correspondence with the results of the analytical laboratory findings. Answers given by residents at a radial distance of 1500 meters from electric stations indicated that the smokestack discharges seriously affected the general living conditions of the population. Examination disclosed that the actual width of the existing clearance zones was approximately 200 meters and that it was not possible to increase its width under the prevailing localization of populated areas; the only way in which this particular sanitary problem could be solved, would be by raising the ash-removing efficiency of the gas purifying equipment.

NOTE: U.S.S.R. Literature on Air Pollution and Related Occupational Diseases by B. S. Levine is distributed by U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C. (1960-62)